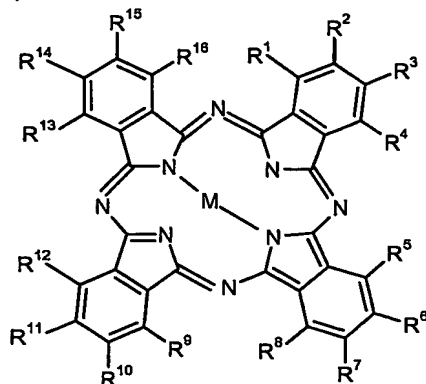


# CLAIMS

1. A phthalocyanine compound of Formula I



wherein at least 5 of the groups represented by R<sup>1</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>8</sup>, R<sup>9</sup>, R<sup>12</sup>, R<sup>13</sup> & R<sup>16</sup> are independently -X-J or -X-L-X<sup>1</sup>-, wherein

each J is independently selected from C<sub>1-6</sub>-alkyl; C<sub>2-6</sub>-alkenyl; C<sub>4-8</sub>-cycloalkyl (each being optionally substituted by a group selected from C<sub>1-4</sub>-alkoxy, C<sub>1-4</sub>-alkylthio, C<sub>6-12</sub>-aryl, C<sub>6-12</sub>-arylthio, C<sub>1-4</sub>-alkylsulphonyl, C<sub>1-4</sub>-alkylsulphonylamino, C<sub>1-4</sub>-alkylsulphoxide, amino, mono- and di-C<sub>1-4</sub>-alkylamino, halogen, nitro, cyano and hydroxycarbonyl (-COOH), hydroxysulphonyl (-SO<sub>3</sub>H) or dihydroxyphosphonyl (-PO<sub>3</sub>H<sub>2</sub>) or C<sub>1-4</sub>-alkyl esters thereof) and from C<sub>6-12</sub>-aryl (optionally substituted by a group selected from C<sub>1-3</sub>-alkyl, C<sub>1-3</sub>-alkoxy, C<sub>1-3</sub>-alkylthio, C<sub>1-3</sub>-alkylsulphonyl, C<sub>1-3</sub>-alkylsulphonylamino, C<sub>1-4</sub>-alkylsulphoxide, amino, mono- and di-C<sub>1-3</sub>-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl or dihydroxyphosphonyl, hydroxycarbonyl-C<sub>1-3</sub>-alkyl, hydroxysulphonyl-C<sub>1-3</sub>-alkyl, dihydroxyphosphonyl-C<sub>1-3</sub>-alkyl or C<sub>1-3</sub>-alkyl esters thereof);

each L is independently selected from C<sub>1-6</sub>-alkylene and C<sub>4-8</sub>-cycloalkylene (each being optionally substituted by a group selected from C<sub>1-4</sub>-alkoxy, C<sub>1-4</sub>-alkylthio, C<sub>6-12</sub>-aryl, C<sub>6-12</sub>-arylthio, C<sub>1-4</sub>-alkylsulphonyl, C<sub>1-4</sub>-alkylsulphonylamino, C<sub>1-4</sub>-alkylsulphoxide, amino, mono- and di-C<sub>1-4</sub>-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl or dihydroxyphosphonyl or C<sub>1-4</sub>-alkyl esters thereof); and from C<sub>6-12</sub>-arylene (optionally substituted by a group selected from C<sub>1-3</sub>-alkyl, C<sub>1-3</sub>-alkoxy, C<sub>1-3</sub>-alkylthio, C<sub>1-3</sub>-alkylsulphonyl, C<sub>1-3</sub>-alkylsulphonylamino, C<sub>1-3</sub>-alkylsulphoxide, amino, mono- and di-C<sub>1-3</sub>-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl, dihydroxyphosphonyl, hydroxycarbonyl-C<sub>1-3</sub>-alkyl, hydroxysulphonyl-C<sub>1-3</sub>-alkyl or dihydroxyphosphonyl-C<sub>1-3</sub>-alkyl or C<sub>1-3</sub>-alkyl esters thereof);

M is an oxymetal group;

each X independently is S, Se, Te or NT;

each X<sup>1</sup> independently is S, Se, Te or NT and directly attached to a peripheral 3,6-carbon atom of another phthalocyanine compound of Formula I;

each T independently is H, alkyl or phenyl, or T & J, together with the N atom to which they are attached, form an aliphatic or aromatic ring provided this N atom is not positively charged; provided where J is aryl, T is not aryl;

and the remaining groups from R<sup>1</sup> to R<sup>16</sup> are independently selected from H, halogen, -OJ, hydroxycarbonyl, hydroxysulphonyl, dihydroxyphosphonyl, hydroxycarbonyl-C<sub>1-3</sub>-alkyl, hydroxysulphonyl-C<sub>1-3</sub>-alkyl and dihydroxyphosphonyl-C<sub>1-3</sub>-alkyl, provided that at least one of R<sup>2</sup> and R<sup>3</sup>, at least one of R<sup>6</sup> and R<sup>7</sup>, at least one of R<sup>10</sup> and R<sup>11</sup> and at least one of R<sup>14</sup> and R<sup>15</sup> is hydrogen, with the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

2. A phthalocyanine compound according to Claim 1 wherein all eight of R<sup>1</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>8</sup>, R<sup>9</sup>, R<sup>12</sup>, R<sup>13</sup> & R<sup>16</sup> comprise a group of the formula -X-J or -X-L-X<sup>1</sup>-, preferably -X-J.

3. A phthalocyanine compound according to Claim 1 or 2 wherein each of R<sup>2</sup>, R<sup>3</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>10</sup>, R<sup>11</sup>, R<sup>14</sup> & R<sup>15</sup> is H.

4. A phthalocyanine compound according to any one preceding Claim wherein the compound has an electronic absorption peak from 750 to 1100 nm, more preferably from 800 to 1000 nm.

5. A phthalocyanine compound according to Claim 4 wherein the compound has at least 90%, preferably at least 95%, of its absorption strength in the region above 400nm at or above 750 nm.

6. A phthalocyanine compound according to Claim 4 or 5 wherein the electronic absorption peak has a band width at half peak height in solution of less than 60 nm.

7. A phthalocyanine compound according to any one preceding Claim wherein J is selected from C<sub>3-6</sub>-alkyl, which may be straight or branched chain; C<sub>2-4</sub>-alkenyl; cyclohexyl; phenyl; naphtha-1-yl or naphtha-2-yl, each of which is optionally substituted as defined in claim 1.

8. A phthalocyanine compound according to Claim 7 wherein J is phenyl, optionally substituted as defined in claim 1.

9. A phthalocyanine compound according to Claim 7 or 8 wherein the substituent(s) for the phenyl; naphtha-1-yl or naphtha-2-yl groups represented by J is(are) independently

selected from C<sub>1-2</sub>-alkyl; C<sub>1-2</sub>-alkoxy; C<sub>1-2</sub>-alkylthio; C<sub>1-2</sub>-alkylsulphonyl; C<sub>1-2</sub>-alkylsulphoxide; amino; mono- and di-C<sub>1-2</sub>-alkylamino; halogen; nitro; cyano; hydroxycarbonyl, hydroxysulphonyl, dihydroxy-phosphonyl, hydroxycarbonyl-C<sub>1-3</sub>-alkyl, hydroxysulphonyl-C<sub>1-3</sub>-alkyl and dihydroxy-phosphonyl-C<sub>1-3</sub>-alkyl and C<sub>1-2</sub>-alkyl esters thereof.

10. A phthalocyanine compound according to any one of claims 7 to 9 wherein the optionally substituted phenyl; naphtha-1-yl or naphtha-2-yl groups represented by J are selected from phenyl, 4-methylphenyl, 2-methylphenyl, 4-i-propylphenyl, 2,4-dimethylphenyl, 2,5-dimethylphenyl, 3,5-dimethylphenyl, 4-methoxyphenyl, 4-methylthiophenyl, 3-(2-[methoxycarbonyl]ethyl)phenyl, 3-(hydroxycarbonyl)phenyl, 4-(hydroxysulphonyl)-phenyl, 2-chlorophenyl, 4-bromophenyl, 3,5-dichlorophenyl, naphtha-1-yl and naphtha-2-yl.

11. A phthalocyanine compound according to any one of the preceding claims wherein the groups R<sup>1</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>8</sup>, R<sup>9</sup>, R<sup>12</sup>, R<sup>13</sup> & R<sup>16</sup> are identical.

12. A phthalocyanine compound according to any one of the preceding claims wherein the compound has a formula:

octa-3,6-(RX)-Pc-M                      Formula III

wherein

M is an oxymetal group selected from VO, TiO and MoO;

Pc is the phthalocyanine nucleus;

each X is independently S, Se, Te or NT wherein T is H, C<sub>1-4</sub>-alkyl or phenyl; and

each R is independently phenyl or naphthyl each of which is optionally substituted by up to 5 groups selected from C<sub>1-3</sub>-alkyl, C<sub>1-3</sub>-alkoxy, C<sub>1-3</sub>-alkylthio, C<sub>1-3</sub>-alkylsulphonyl, C<sub>1-3</sub>-alkylsulphonyl-amino, C<sub>1-3</sub>-alkylsulphoxide, amino, mono- and di-C<sub>1-3</sub>-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxy-sulphonyl, dihydroxyphosphonyl, hydroxycarbonyl-C<sub>1-3</sub>-alkyl, hydroxysulphonyl-C<sub>1-3</sub>-alkyl or hydroxyphosphonyl-C<sub>1-3</sub>-alkyl or C<sub>1-3</sub>-alkyl esters thereof; or

R & T together form a piperidiny, piperaziny, morpholiny or pyrroliny ring.

13. A phthalocyanine compound according to any one of the preceding claims wherein X and/or X<sup>1</sup> is sulphur.

13 A phthalocyanine compound according to any one preceding Claim wherein each of R<sup>1</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>8</sup>, R<sup>9</sup>, R<sup>12</sup>, R<sup>13</sup> & R<sup>16</sup> is 4-methylphenylthio and each of R<sup>2</sup>, R<sup>3</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>10</sup>, R<sup>11</sup>, R<sup>14</sup> & R<sup>15</sup> is H.

14 A phthalocyanine compound according to any one preceding Claim wherein M is VO.

15 A method for the production of a lithographic printing plate containing a photosensitive layer comprising irradiating the photosensitive layer with an infra-red laser in accordance with pattern information wherein the photosensitive layer comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

16 A method of polymer welding in which a polymer material is irradiated with infra-red laser in a region where it is desired to form a weld wherein the polymer material comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc, or wherein the polymer material is coated or printed with the compound where it is desired to form a weld, or wherein the compound is provided in a layer or film which is located adjacent the polymer material where it is desired to form a weld.

17 A method for the protection of an interior of a glazed structure against the heating effect of incident IR radiation by incorporating into the glazing or a layer forming part of the glazing a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

18. A method for the attenuation of IR irradiation passing through a protective film by incorporating into the protective film or a layer forming part of the protective film an compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

19 A method for detecting an article carrying a superficial image by scanning with an infra-red detector wherein the image comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

20 A method for the formation of a permanent toner image on a substrate using an electrophotographic device incorporating an IR source to fix the temporary toner image on the substrate and/or provide an IR-readable permanent toner image wherein the toner comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

21. An article carrying an image adapted for machine reading in response to a reflective signal generated by scanning the image with infra-red radiation wherein the image comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

22. A method for the enhancement of a thermal signal comprising incorporating into or onto the article from which the thermal signal is derived a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

23. An ink comprising a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

24. An ink according to Claim 23 also comprising a colorant.

25. An ink according to Claim 23 or Claim 24 also comprising an alkoxyated or polyalkoxyated acrylate monomer and a photoinitiator.

26. Use of compounds of formula I in claim 1 but without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc as a security marker.

27. A method of establishing the authenticity of an article or substrate comprising marking the article or substrate with a mark including a compound according to formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc and detecting and/or measuring a characteristic absorption of infrared radiation by the mark.